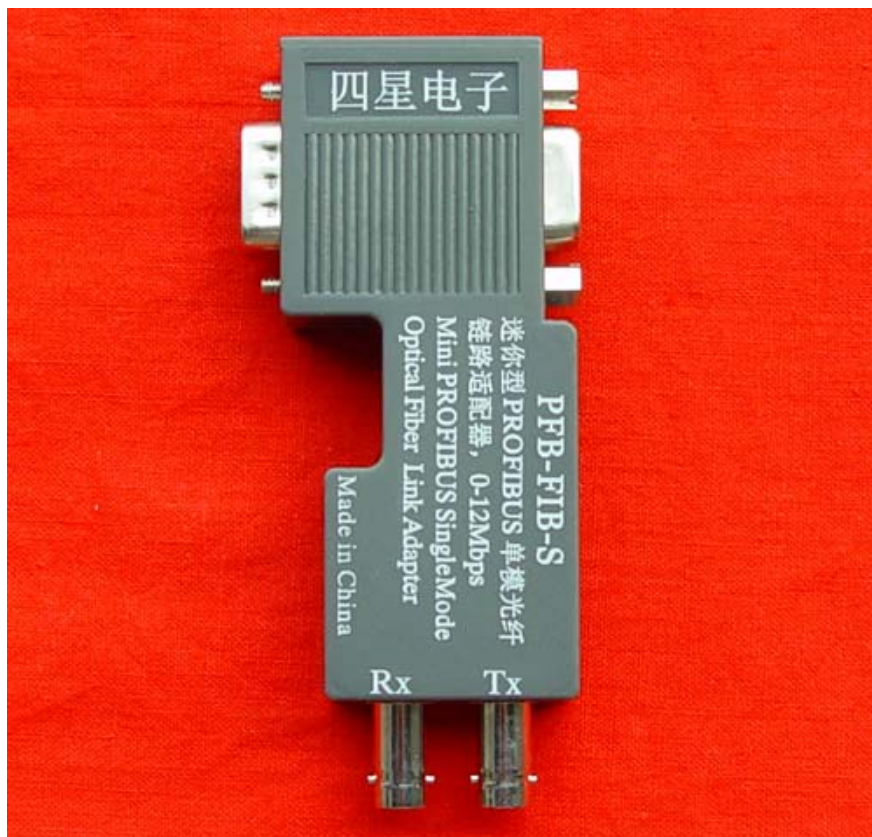


Mini PROFIBUS single-mode Fibre Link Adaptor

PFB-FIB-S

User Manual



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Introduction

Thank you for using field bus optical fibre link products manufactured by Deyang FOURSTAR Electronic Technology Co., Ltd.

Please read this User Manual carefully before use. You will know the product's complete function as well as easy operation.

This manual illustrates Mini PROFIBUS Fibre Link Adaptor PFB-FIB-M (multimode) or PFB-FIB-S (single mode) in detail. Multimode and single mode products only use different optical fibre, while other functions are totally the same.

This product mainly applies to PROFIBUS, MPI, PPI field bus network, converts RS485 electrical signal into optical signal and transfers the signal by optical fibre to achieve high-speed and remote transmission of PROFIBUS. The bottleneck problem of short copper cable distance during PROFIBUS high speed transmission is solved, meanwhile, the network has good electrical isolation and anti-interference ability due to natural isolation function of the fibre.

FOURSTAR Mini PROFIBUS Fibre Link Adaptor has novel appearance, with the same outline and size as that of PROFIBUS bus connector. It can directly insert into equipment PROFIBUS/MPI/PPI socket, or into bus connector with programmable port on bus. No external power is needed. Line type, star like and mixed type optical fibre network is available. The operation is simple and convenient. Therefore, we also name it optical fibre bus connector.

Please operate the device in accordance with specification and parameters specified in User Manual. The company is not responsible for any property loss or personal injury caused by improper operation by user.

The company preserves the right to modify content and production function in this manual without prior notice in accordance with technology development requirement.

Copyright Statement

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Version Information

Document name: Mini PROFIBUS single-mode Fibre Link Adaptor User Manual

Version: V2.0

Date of modification: 2012-08-20

Including

1. One set of PFB-FIB-S.
2. One compact disk (containing user manual. This product does not require any software or driver.)

I. Overview

PROFIBUS is currently the most widely used field bus, in the event of high speed communication in particular, it embodies many advantages. As physical layer of PROFIBUS bus adopts interface technology based on RS485, in case of high speed communication, only short RS485 cable can be used. When the speed is 3~12Mbps, maximum length of cable can only reach 100 meters.

Since transmission distance of optical fibre is irrelevant with speed, convert PROFIBUS electrical signal into optical signal and transmit by optical fibre solves the bottleneck problem of short copper cable distance during PROFIBUS high speed transmission perfectly. Meanwhile, by adopting optical fibre as communication transmission medium, it solves electromagnetic interference, ground wire loop interference and lightning damage fundamentally. It has been applied to fields such as industrial automation, distributed data collection, intelligent transportation system, electricity, water and bank more and more frequently, and becomes preferred solution to communication transmission.

PFB-FIB-S is an industrial PROFIBUS-DP to optical fibre adaptor produced by FOURSTAR, also named optical fibre bus connector, with the same size with that of PROFIBUS bus connector plug, insert into equipment PROFIBUS/MPI/PPI socket, or into bus connector with programmable port on bus. No external power is needed. Line type, star like and mixed type optical fibre network is available. The operation is simple and convenient. It can replace SIEMENS OLM optical fibre link modules. Transparent transmission of PROFIBUS-DP signal on optical fibre is achieved. It is not necessary to revise original communication protocol and software, plug and play. It can replace copper wire conductor transmission

without any settings. This product complies with binary bit transparent data transmission. Therefore, it is suitable for any communication protocol with RS485 physical interface.

II. Main Application and Features of Mini PROFIBUS Fibre Link Adaptor

Main applications of Mini PROFIBUS Fibre Link Adaptor are as below:

1. Increase PROFIBUS transmission distance. Under PROFIBUS whole speed (4.8Kbps~12Mbps), it can extend transmission distance to 4km (multimode fibre) or 12km (single mode fibre) by optical fibre. Fibre length is irrelevant with communication speed.
2. It solves electromagnetic interference, ground wire loop interference and lightening damage fundamentally.
3. Facilitate implementation of large-scale, scattered and complicated PROFIBUS network. For example, use copper cable in short distance and fibre in long distance.
4. Apply to occasions which require safety explosion proof, such as mine, chemical industry, electric power and oil-gas field. It has natural safety isolation function.

Mini PROFIBUS Fibre Link Adaptor has the following features:

1. Physical layer transparent transmission. FOURSTAR Mini PROFIBUS Fibre Link Adaptor adopts physical layer bit transparent transmission, irrelevant with upper layer protocol, therefore, it is applicable to all PROFIBUS protocol based on RS485, including PROFIBUS-DP/V0, V1, V2, and various application standards, including PROFIsafe, Redundancy, Ident Systems, etc. It supports connecting multi master stations communication, such as S7 FUNCTION protocol and secondary master station communication; and MPI protocol, PPI protocol and RS485 free port protocol communication, it also applies to other field bus or network with RS485 technology, such as MODBUS.
2. It doesn't need master station configuration or GSD file.
3. Irrespective of master/slave station interface, input/output interface, terminal/non-terminal joint.
4. Baud rate 0~12Mbps self-adaption, do not need switch setting or any software configuration.
5. Natural isolation between optical fibre link adaptor, and solves electromagnetic interference, ground wire loop interference and lightening damage fundamentally.

6. With the same outline and size as that of PROFIBUS bus connector. It can directly insert into equipment PROFIBUS/MPI/PPI socket, or into bus connector with programmable port on bus. No external power is needed. Various kinds of network topology can be formulated, such as point-to-point connection, line type connection, star like connection, and mixed type connection.

III. Product Features and Main Technical Parameters

- Power: 24VDC power output by pin 7 and pin 2 on equipment PROFIBUS/MPI/PPI socket, or 5VDC power by pin 6 and pin 5. Automatic selection. Plug and play. 24VDC power and 5VDC power are isolated by DC/DC isolation power module.
- Power consumption: about 0.5W.
- Communication rate: 0~12Mbps no time delay, automatic adaption.
- PROFIBUS electrical interface: DB9M (pin) plug. Definition of pin signal complies with PROFIBUS standard.
- Maximum communication distance of each electrical port cable under each transmission speed complies with PROFIBUS standard:

Transmission rate (bit/s)	9.6K	19.2K	45.45K	93.75K	187.5K	500K	1.5M	3M	6M	12M
Maximum cable length (meter)	1200				1000	400	200	100		

- Electrical interface RS485 port has surge protection and $\pm 15\text{kV}$ anti-static protection.
- Has a pair of optical fibre transmit-receive interface, can formulate line type, star like and mixed type optical fibre network.
- Applicable optical fibre: single-mode 9 / 125, 10/125, 8.3/125 μm .
- Wave length: 1310nm.
- Emitted light power: -6dBm.
- Receiving sensitivity: -18dBm.
- Optical fibre transmission distance: 0~12km.
- Optical fibre interface: standard ST connector, optional SC, FC connector.
- LED indicator combining optical fibre connection and data receiving.

- Work temperature: -40~+85℃ industrial grade.
- Overall dimension: 96mm×17mm×42mm (L×W×H), weight: 70g.
- Installation: Insert into equipment PROFIBUS/MPI/PPI socket, or into bus connector with programmable port on bus.

IV. External Structure and Pin Definition

1. Overall dimension:

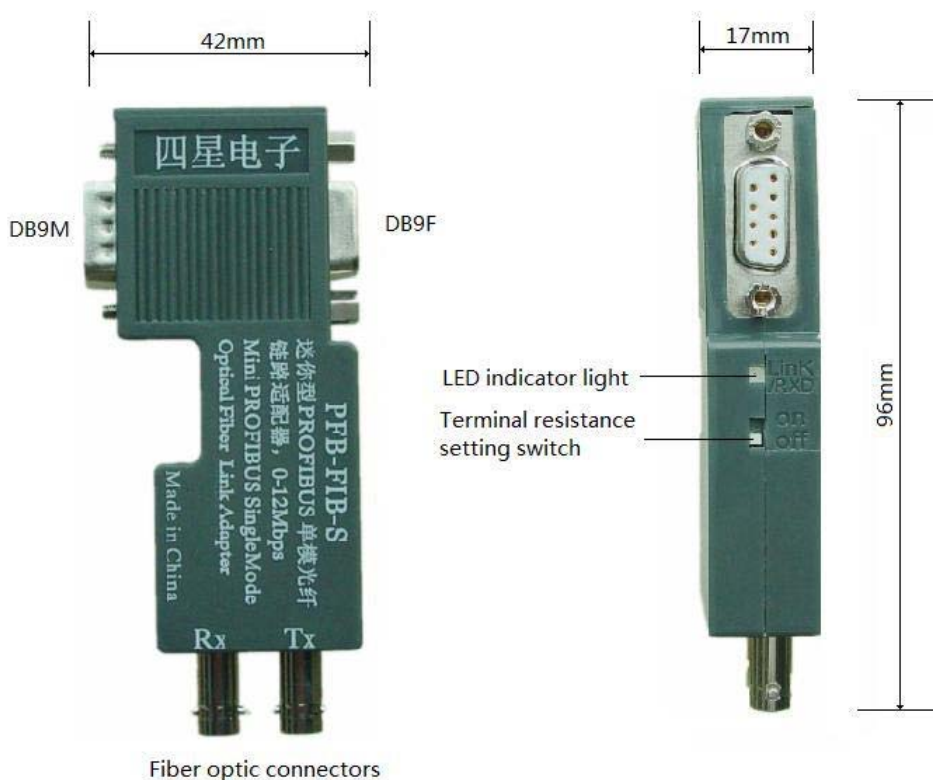


Figure 4-1 Outside view of Mini PROFIBUS single-mode Fibre Link Adaptor

2. Indicator: a LED indicator is on Mini PROFIBUS single-mode Fibre Link Adaptor, display optical fibre connection status and data receiving status.

Indicator name	Indicator status		
	On	Twinkle	Off
Link/RXD	Optical fibre is connected.	Receiving data from optical fibre.	Power is not connected or optical fibre is not connected.

Note: when optical fibre is disconnected or remote optical fibre link adaptor is power off, a breakdown signal will generate from DP bus, taking 350ms of bus time, meanwhile, Link/RXD indicator light off.

3. Terminal resistance setup switch:

When switch is in “off” position: no terminal resistance or bias resistance

When switch is in “on” position: internal RS485 connect to 220 ohm terminal resistance and two 390 ohm bias resistance.

4. Definition of signal on PROFIBUS-DP electrical interface of Mini PROFIBUS single-mode Fibre Link Adaptor:

Definition of PROFIBUS electrical interface DB9M (pin seat)

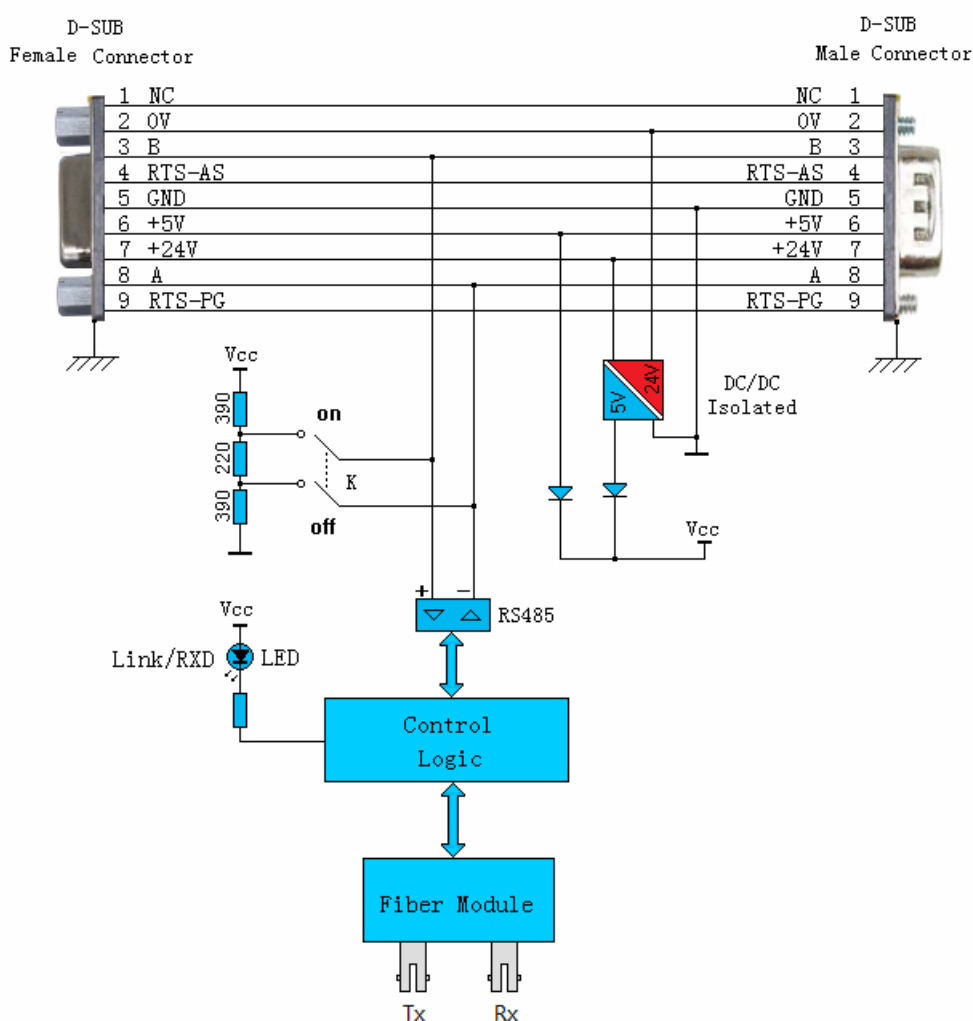
DB9M pin No.	Pin name	Function	Signal direction
3	DB (+)	RS485 signal positive	Input/output
8	DA (-)	RS485 signal negative	Input/output
6	+5VDC	Supply 5VDC power positive to adaptor	Input
5	GND	RS485 signal ground (supply 5VDC power negative to adaptor)	Input
7	+24V	Supply 24VDC power positive to adaptor	Input
2	0V	Supply 24VDC power negative to adaptor	Input
1、4、9	No use	No use (connect with 1, 4 and 9 of DB9F)	

Definition of PROFIBUS electrical interface DB9F (hole seat)

DB9M pin No.	Signal name	Function	Signal direction
3	DB (+)	RS485 signal positive	Input/output
8	DA (-)	RS485 signal negative	Input/output
6	+5VDC	5VDC power output positive	Output
5	GND	RS485 signal ground (5VDC power output negative)	Output
7	+24V	24VDC power output positive	Output
2	0V	24VDC power output negative	Output
1、4、9	No use	No use (connect with 1, 4, 9 DB9M)	

5. Fibre interface: FOURSTAR Mini PROFIBUS single-mode Fibre Link Adaptor has a pair of fibre interface, Tx light sending and Rx light receiving connector. The connection of fibre connector on remote fibre adaptor complies with the principle of sending connect to receiving and receiving connect to sending.

V. Internal Functional Block Diagram of Mini PROFIBUS Fibre Link Adaptor

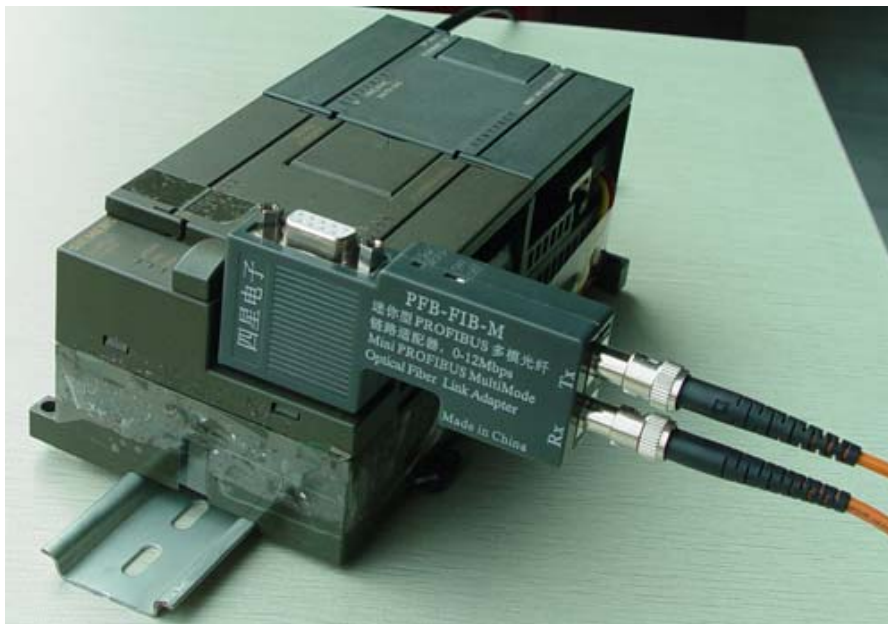


5-1 Internal Functional Block Diagram of
FOURSTAR PROFIBUS Optic Link Module

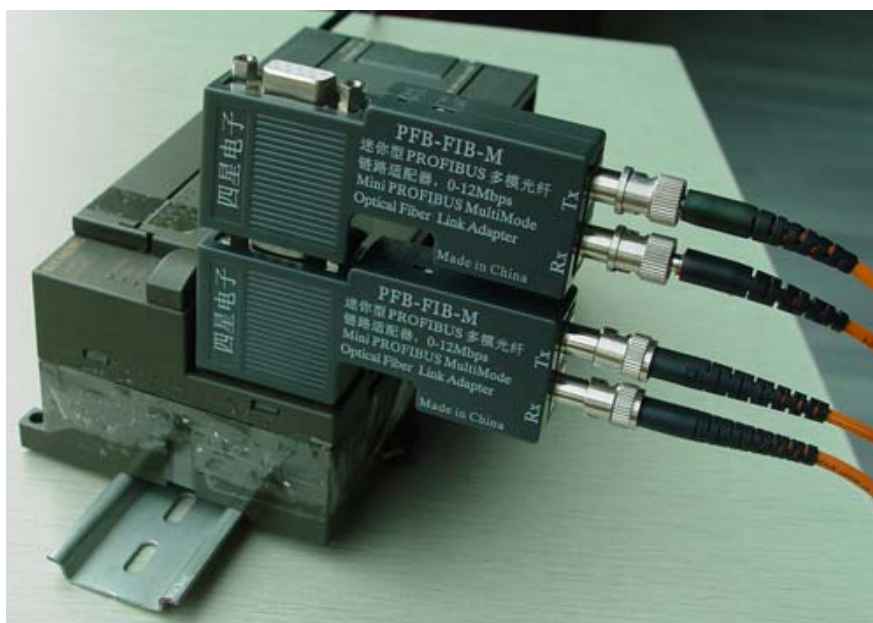
VI. Application Project of Mini PROFIBUS Fibre Link Adaptor

FOURSTAR Mini PROFIBUS single-mode Fibre Link Adaptor is very simple and flexible, without any setup, plug and play. It supports point-to-point connection, line type connection, star like connection and mixed type network topology of fibre, but not redundant optical fibre ring network. According to different network topology structure, three basic installation methods are as follows:

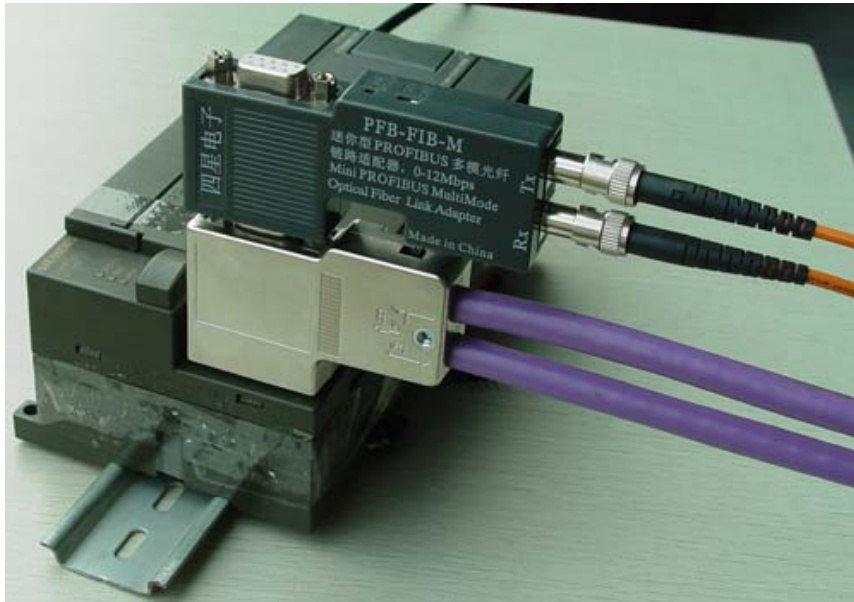
A. Mini PROFIBUS optical fibre link adaptor can directly insert into standard DB9F socket of equipment PROFIBUS/MPI/PPI.



B. Two mini PROFIBUS optical fibre link adaptors overlapping insert into equipment PROFIBUS/MPI/PPI DB9F socket.



C. Mini PROFIBUS optical fibre link adaptor insert into any bus connector with programming interface.



The following is several typical application schemes of mini PROFIBUS optical fibre link adaptor.

1、 Replace bus connector to form cable-free full fibre PROFIBUS network:

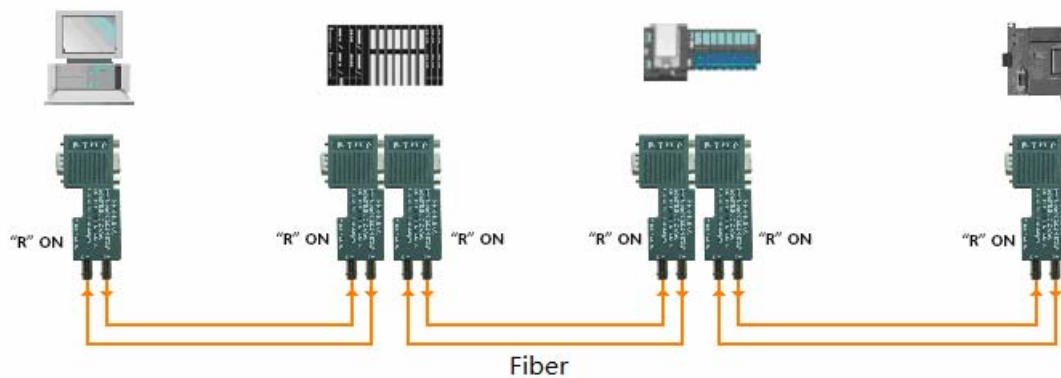


Figure 6-1 Mini PROFIBUS optical fibre link adaptor formulate full fibre bus network

2、Line type connection:

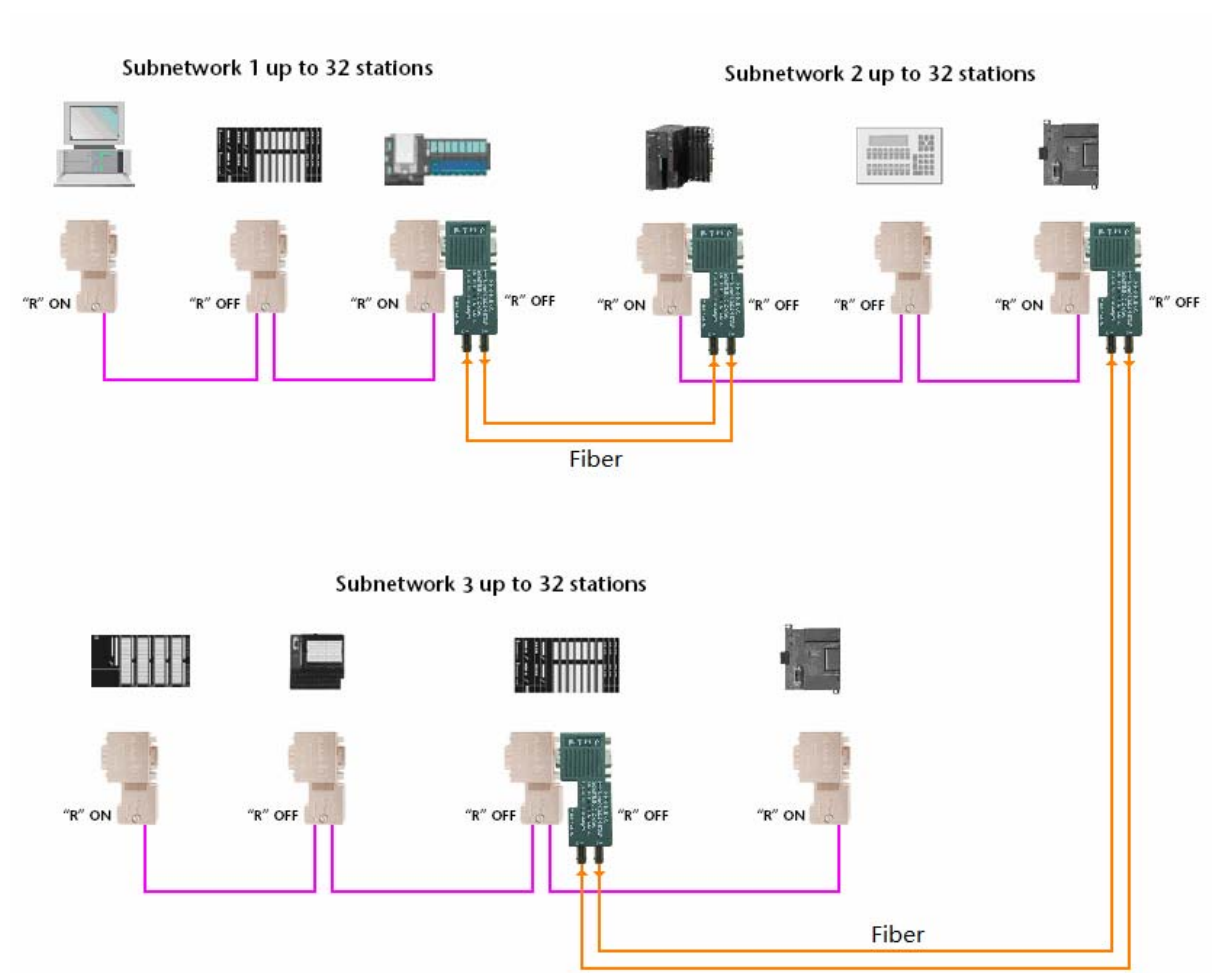


Figure 6-2 Mini PROFIBUS optical fibre link adaptor formulate line type optical connection

3. Star connection:

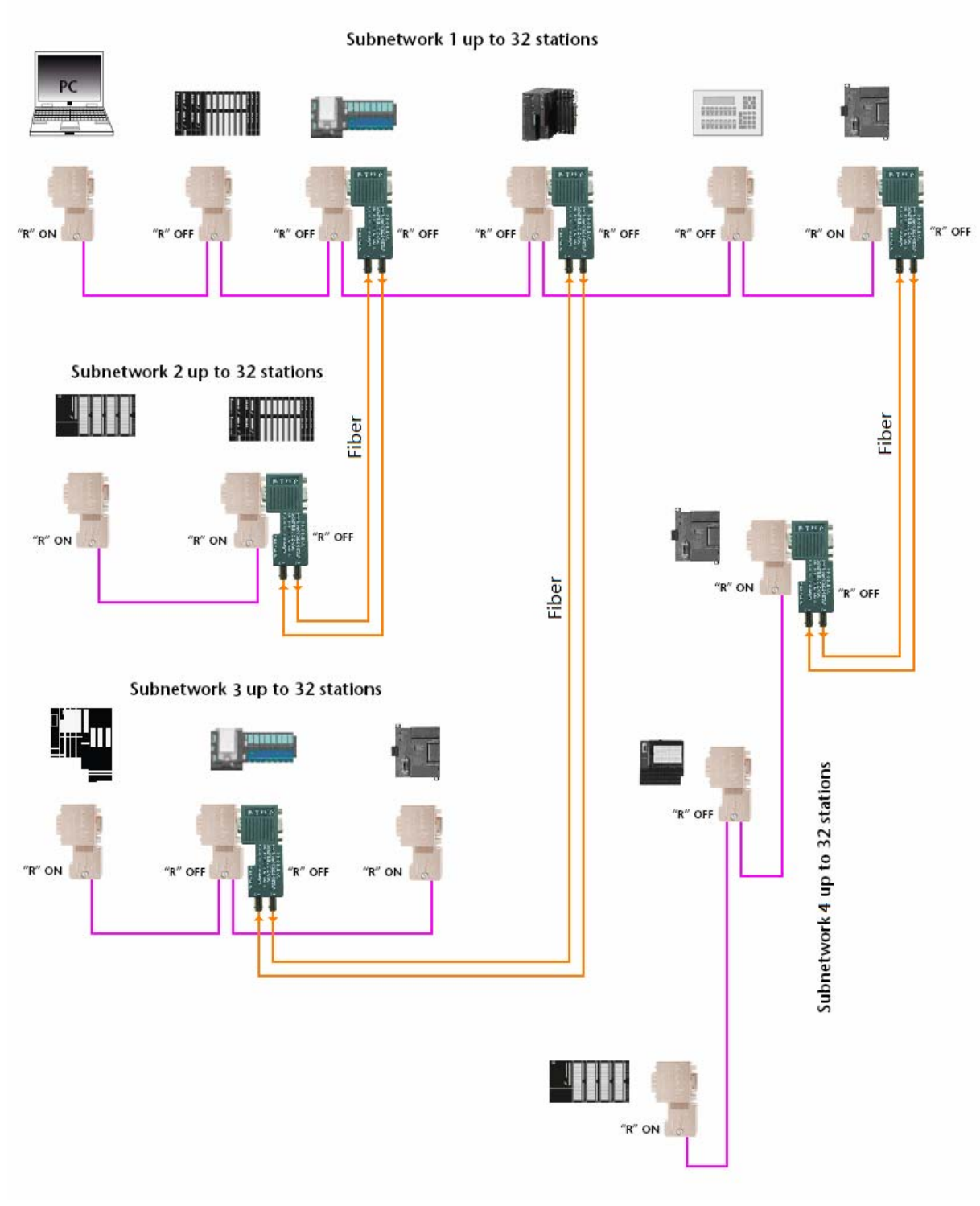


Figure 6-3 Mini PROFIBUS optical fibre link adaptor formulate star like optical fibre connection.

4. Formulate PROFIBUS fibre hub hybrid network with PROFIBUS concentrator.

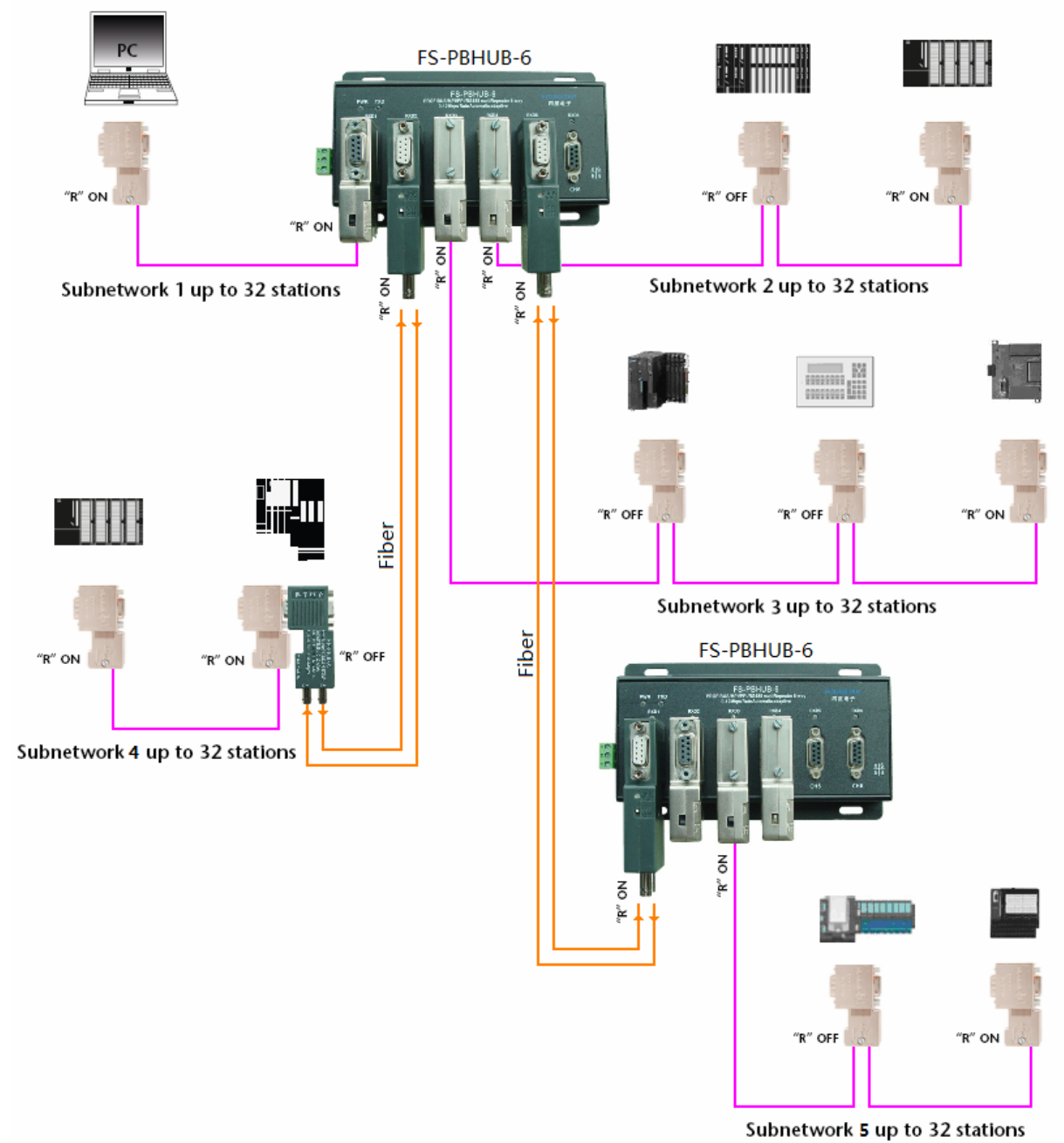


Figure 6-4 Mini PROFIBUS optical fibre link adaptor formulate hybrid fibre connection with PROFIBUS concentrator

VII. FAQ

1. Where does Mini PROFIBUS optical fibre link adaptor get its work power?

As long as either there is 5VDC output between pin 6 and pin 5 of equipment PROFIBUS/MPI/PPI socket (DB9F socket), or 24VDC output between pin 7 and pin 2, the adaptor will get normal work power. For products designed in accordance with PROFIBUS standard, its DB9F interface socket all comply with the above requirement.

2. What the difference between PROFIBUS optical fibre link adaptor PFB-FIB-M and PFB-FIB-S?

PFB-FIB-M adopts multimode fibre, with maximum transmission distance of 4km, while PFB-FIB-S adopts single mode fibre, with maximum fibre distance of 12km. Do not misuse their fibre, or it will result in communication failure. The rest functions are the same.

3. When fibre breaks or remote optical fibre link adaptor is power off, will it affect the whole network communication?

When fibre breaks or remote optical fibre link adaptor is power off, the local adaptor will not receive optical signal. During this time, a breakdown signal will generate from DP bus, taking up 350ms, meanwhile, the corresponding fibre Link/RXD indicator will be off, and then bus return to gap state.

4. Why the station served as terminal in the network can't be power off?

The head and end of PROFIBUS network is called terminal. To restrain reflection and distortion of RS485 signal, the end cable shall connect to A1 and B1 terminal of bus connector. Terminal resistance setup switch on bus connector plug of terminal interface must be switched to ON position, so that terminal interface connect with a 220 ohm terminal resistance, a 390 ohm pull-up resistor and a 390 ohm pull-down resistor to make sure the network runs stably. The pull-up and pull-down resistor needs pin 6 and pin 5 on DP socket to supply 5VDC work power. When terminal station is power off, 5 VDC work power of pull-up and pull-down resistor is off, which will cause abnormal network communication or communication failure.

5. What if the terminal station can't avoid power failure?

If limited by field condition, the terminal station must be power off, to ensure normal network communication, active terminal resistance (make sure it won't be power off) must be installed on segment terminal as its terminal. Product number of active terminal resistance produced by SIEMENS is 6ES7 972-0DA00-0AA0, FOURSTAR active terminal resistance model is PB-TR485.

6. PROFIBUS interface on our equipment is wiring terminal. How can we install Mini PROFIBUS optical fibre link adaptor?

It is troublesome to install Mini PROFIBUS optical fibre link adaptor on such equipment. We recommend user to choose other two PROFIBUS link modules offered by FOURSTAR, which is FS-OLM-M or FS-OLM-S.

7. How to make sure the whole network reaches maximum communication speed?

Application of PROFIBUS optical fibre link adaptor can formulate complicate mixed type network. Each segment varies from length. Whether the whole network can reach maximum communication or not is determined by the longest cable segment rather than the optical fibre. If you want to enhance communication speed, you can use repeater or concentrator to cut relatively long cable segment or use optical fibre link adaptor to make it comply with your requirement on speed.

8. How to realize high speed and remote communication of PROFIBUS?

When PROFIBUS is under high speed communication, for example, under communication speed higher than 3Mbps, cable can be 100 meters at most. Adding more repeaters or concentrators will result in increased signal delay, increased cost or inconvenient power supply, etc. Optical fibre transmission is currently the most cost effective plan, such as FOURSTAR PROFIBUS optical fibre link module FS-OLM-S and FS-OLM-M, or Mini PROFIBUS optical fibre link adaptor PFB-FIB-M and PFB-FIB-S.

9. Can Mini PROFIBUS optical fibre link adaptor be in mixed use with PROFIBUS optical fibre products by other manufacturers?

Mini PROFIBUS optical fibre link adaptor produced by FOURSTAR can mix up with its other PROFIBUS optical fibre link product, such as FS-OLM-M, FS-OLM-S, FIB-P485-M, and FIB-P485-S, but can't mix up with PROFIBUS optical fibre products by other manufactures, such as SIEMENS.

VIII. Oder Information

Product name: Mini PROFIBUS optical fibre link adaptor (also named: optical bus connector)

Product model: PFB-FIB-M (multimode) or PFB-FIB-S (single mode)

Statement: this document aims at providing instructions for users to use PROFIBUS fibre link adaptor model PFB-FIB-M (multimode) or PFB-FIB-S (single mode). As new technology is developing rapidly, product function is subject to actual condition. Deyang FOURSTAR Electronic Technology Co., Ltd. preserves right to modify this document without prior notice.

Deyang FOURSTAR Electronic Technology Co., Ltd.

Address: 2/F, Block H, No. 88 Section 2, Lushan South Road, Deyang City, Sichuan China

Tel: +86-838-2515543 2515549

Fax: +86-838-2515546

Website: <http://www.fourstar-dy.com>